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PRODUCTION OF SPINACH

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Commercial Importance

Spinach is the most important crop grown for greens in the United States, and its popularity for this use seems to be increasing. Data collected by the Bureau of Agricultural Economics show that in 1936 about 76,000 acres were devoted to the growing of spinach for marketing fresh and that in the same year about 27,000 acres were grown for canning. The total value of the spinach crop to the growers in 1936 was over $6,000,000.

The culture of spinach for marketing fresh is of most importance in Texas, Virginia, California, Louisiana, New Jersey, Maryland, and Missouri. California ranks first in the production of spinach for canning.

Characteristics

Spinach is a quick-maturing, cool-season crop, and it may well be utilized to occupy land available for only a short period in spring or autumn. It is very hardy and will live outdoors over winter throughout most portions of the region from New Jersey southward along the Atlantic coast and in most portions of the lower South. In the district about Norfolk, Va., and in many sections southward, spinach is planted in the open in late summer for fall harvesting. It is also planted in the autumn and left in the field without protection during the winter, being cut for market during the late winter and early spring. In colder sections it may be grown as a winter crop in coldframes or in heated frames. In milder sections it is not difficult for the home gardener to supply himself with spinach for winter use by employing simple coldframes or hotbeds. In sections where spinach is grown for canning it is usually planted as an early spring crop to be harvested before hot weather arrives. Spinach, fresh or canned, is a particularly desirable addition to the diet, as it is high in vitamins and in certain beneficial mineral elements.

Types and Varieties

There are two distinct types of spinach as regards seed characters—the prickly seeded and the smooth or round seeded. Of the prickly-seeded type, the most important variety is Prickly or Winter, a large, flat-leaved, rapid-growing variety which is extensively grown in California for canning. The round-seeded type is the more im-

58191°—38

portant, since it includes most of the varieties grown for market that can be distinguished upon the basis of leaf characters, such as the smooth or flat-leaved type and the crumpled or savoy-leaved type. Although large acreages of flat-leaved varieties are grown for the market in Texas, the savoy-leaved type is probably the most popular over the country as a whole. Among both the flat-leaved and the savoy-leaved types there are varieties that differ greatly in their rate of growth and quickness of shooting to seed. Long-standing Bloomsdale Savoy (fig. 1) and the Blight-Resistant Virginia Savoy are two of the leading varieties of the savoy-leaved type. Giant Nobel (or Giant Thick-Leaved) and Viroflay are popular among the more or less flat-leaved quick-growing sorts. Julianna is a splen-

FIGURE 1.—Bloomsdale Savoy spinach.

did second-early, long-standing sort with thick, crumpled, dark-green leaves; it is slow in producing seedstalks. Victoria is a splendid variety for the home market garden as it matures late but has long-standing qualities and may be planted where the cutting period extends into the summer. The Virginia Blight-Resistant Savoy, developed at the Virginia Truck Experiment Station for blight resistance, is especially recommended for planting on land in which the blight disease is present. Long-standing or Bloomsdale Savoy grows somewhat smaller than the regular Bloomsdale Savoy and stands 12 to 14 days longer before shooting to seed. This variety is recommended to follow the regular Bloomsdale Savoy, although both varieties can be planted at about the same time. The Virginia Savoy is very similar to Bloomsdale Savoy in its appearance, but is more resistant to cold and decidedly resistant to the spinach mosaic or

so-called blight. This variety is adapted mainly for fall culture, as it shoots to seed very quickly when planted in the spring.

In choosing a variety or varieties the grower should consider market requirements, climatic conditions, and the season of the year during which the spinach is to mature.

New Zealand spinach is not a true spinach, but an entirely different plant which grows to a height of 18 inches to 2 feet, with a much-branching and spreading habit of growth. It is sensitive to cold but resistant to heat, and is often grown as a substitute for spinach during weather that is too hot for spinach.

Soils and Their Preparation

Rich sandy loams with an abundance of organic matter are looked upon in most sections as best for the growing of spinach. An abundance of moisture is essential to a rapid and uninterrupted growth of the crop, and in some sections irrigation is resorted to. The methods followed in preparing and handling the soil are determined to a certain extent by the methods followed in the application of the water when artificial irrigation is followed.

The preparation of a finely pulverized seedbed that enables the soil to make intimate contact with the seed, and later on with the roots of the plants, contributes much to the securing of good results. The actual methods followed in obtaining such a seedbed are determined by the character of the soil and the kind of equipment available. For the early spring crop fall plowing is usually advisable if there is no danger from washing of the soil during winter. When spinach is grown as a fall crop following some other unrelated cultivated crop, such as early potatoes, the use of the turning plow is seldom necessary. In such cases the disk harrow is usually used to stir the seedbed to a depth of 3 or 4 inches. The disk harrow is followed by a planker or smoothing harrow, to put the ground in suitable condition for the seed. It is always wise to continue the preparation of the soil until a perfect seedbed is secured, as it is much better to work the soil to the proper condition before the crop is planted than to cultivate it under handicaps after the plants are up.

Fertilizers and Manure

Stable or barnyard manure applied to the soil for spinach usually gives good results. Such applications are advisable when the manure can be obtained without excessive cost. In the past it has been the practice to use it at high rates of application, often as much as 30 tons per acre. With the present scarcity and high cost of manure such applications are usually impracticable. The principal value of the manure lies in the organic matter it contains, because nitrogen, phosphoric acid, and potash can be obtained in the form of commercial fertilizers at much lower cost. Crop rotation, including green manures, will supply the soil with organic matter from decaying cowpeas, soybeans, the clovers, vetches, or other soil-improving crops, thereby making it possible to use an abundance of commercial fertilizer. The logical procedure for most producers of spinach would

seem to be to follow cropping systems and rotations that will keep the soil supplied with organic matter and to supply the main part of the plant food in the form of commercial fertilizers.

In cases where the spinach follows some heavily fertilized crop, such as potatoes, and where there is a considerable residual amount of plant food in the soil from these crops, the quantities of fertilizer necessary to obtain a good crop of spinach are less than where the soil has not had such previous treatment.

In the eastern part of the United States spinach has been shown to respond very well to both nitrogen and phosphoric acid in fertilizers. From 1,200 to 1,500 pounds of a mixture containing 9 percent of nitrogen, 8 percent of phosphoric acid, and 3 percent of potash has been found very satisfactory. On light soils approximately half of this should be applied before planting and the remainder should be applied as two top dressings at intervals during the development of the crop. At least two-thirds of the nitrogen should be in a readily available inorganic form. Upon heavier soils, less subject to leaching, a larger quantity of complete fertilizer can be applied before planting and one or two top dressings of readily available nitrogenous fertilizer later on.

Lime

Spinach is extremely sensitive to soil acidity and cannot be grown on land that is strongly acid. The work of H. H. Zimmerly at the Virginia Truck Experiment Station shows that a soil having a pH (hydrogen-ion concentration) of about 6.0 to 6.5 is best for spinach. When doubt exists regarding the need of the soil for lime, it should be tested by one of the numerous methods now available. County agents and the various State agricultural experiment stations are able to supply information regarding these tests. If the soil shows greater acidity than that indicated by pH 6.0, lime should be used. It is usually best to apply the lime broadcast while the land is being prepared for seeding. A ton of ground limestone per acre is sufficient for mildly acid soils.

When To Sow

With normal spring weather it is usually possible to obtain excellent crops of spring-grown spinach. The seeding should be done as soon as the ground can be worked. This early planting not only makes it possible to get the crops out of the way before hot weather arrives but also makes the ground available for such crops as sweet corn, late cabbage, or tomatoes. Spinach will not withstand hot weather, and it is useless to sow at such a season that it would reach the edible stage during periods of high temperature. Early planting in the spring is important.

In regions where only light freezes occur in the fall, growth will continue until a late-summer or early fall sowing can be harvested. If hard freezes do not occur until late November, sowings made the first of September should make good yields. In colder sections the development of the fall-sown crop will be retarded so that it may not be ready for harvest until early spring. Later sowings also may not reach profitable size until spring, even though they live through the

winter in the open field. In the Northern States some protective covering must be employed to keep the crop from being killed. Through a wide belt running across the country in the general latitude of New Jersey, Maryland, and Virginia, it is possible to sow spinach during late August or early September and mature the crop during the cool days of late autumn, except in mountainous localities, where the season is shorter than at low altitudes.

Sowing the Seed

The quantity of seed required to plant an acre depends on the distance between the rows and the thickness of seeding in the row. With the rows from 10 to 20 inches apart and the plants from 3 to

FIGURE 2.—Spinach grown in rows 8 to 10 inches apart. A cutter is being run underneath the row to loosen plants for harvesting.

6 inches apart in the rows it usually requires from 10 to 15 pounds of seed to sow an acre. On land which is not infested with weeds and where cultivation is unnecessary the crop may be sown broadcast or drilled in rows 8 to 10 inches apart (fig. 2). In such cases 25 to 30 pounds of seed per acre are often used, although under these conditions some of the best growers believe that lighter seeding (18 to 20 pounds) will permit a better development of individual plants, with a consequently higher quality of the product. When poorly germinating seed is used the rate of seeding should, of course, be increased so that a full stand will be obtained.

Raised beds, 5 to 7 feet in width, as shown on the cover page, are usually prepared for the fall-sown crop that is to remain over winter. These are thrown up by back-furrowing and are, as a rule, wide enough to accommodate from four to eight rows. In the Norfolk, Va., district a large portion of the crop is grown on these raised beds. Most of the spring crop is grown by level culture. In the Baltimore, Md., area somewhat wider beds are formed, sloping to the south, to afford protection from the northerly winds and to obtain higher soil temperatures and more rapid growth in the early spring.

Where large areas are to be grown, a forced-feed drill is a necessity for sowing the seed of the round-seeded sorts. With the prickly seeded kinds it is even more difficult to obtain satisfactory results, as the seed is liable to clog the drill. In large-scale operations gang seeders consisting of several individual drills are sometimes used. These are attached behind a planker or roller, which serves the double purpose of giving the soil its final fitting and acting as a spacing bar for the drills. With such a device several rows can be sown in each trip across the field. In some regions it is a common practice to use a grain drill, sowing the seed in rows 7 or 8 inches apart.

Good, fresh seed is always desirable, since seed more than a year old rarely germinates over 80 percent, while older seed may be even less viable. It is very important that the soil be well firmed over the seed after planting by rolling or similar treatment. Most seed drills are fitted with a roller, which firms the soil over the spinach seed after it is sown. Many failures of spinach are the direct result of neglecting to observe this detail.

Cultivation and Care

Cultivation is unnecessary in localities or fields that are not infested with weeds, and is not generally practiced in the large-scale operations of the West and Southwest or in the Baltimore district. In the Norfolk district and in the majority of small-scale market-garden operations wider spacing of rows and cultivation is the general practice. When used, cultivation should be very shallow and frequent enough to control weeds.

In localities where cultivation is necessary, it is the usual practice to thin the plants to about 4 inches apart in the row. Thinning should be done about the time the plants show two good-sized true leaves. As an aid in thinning, a tool shaped like an ordinary spoon and known as a thinning spoon is frequently used. It should be the purpose of the grower to maintain the spring and early fall crops in a rapidly growing condition from the time the plants appear until the crop is harvested.

On the lighter soils it is a common practice to top-dress the crop once or twice during the growing season with readily available nitrogenous fertilizers at the rate of 150 to 200 pounds per acre, using in some instances a somewhat heavier application of complete fertilizer high in nitrogen. Very little nitrogen is applied to land on which spinach is seeded late in the fall for early-spring marketing on

account of the danger of winter injury. When growth starts in late winter or early spring, top dressings of nitrate of soda or fertilizers containing a high percentage of readily available nitrogen should be made to stimulate growth.

Diseases and Insects

Mosaic, or spinach blight, is the most destructive disease of spinach, but losses from this disease can be largely avoided by crop rotation and by the use of the Virginia Blight-Resistant Savoy variety for fall planting.

Insect injury to spinach is not common, although the spinach aphid or louse occasionally does considerable damage, and reports are not infrequently made of injuries by the spinach leaf miner and the seed-corn maggot. The spinach aphid not only sucks the juices from the plants and renders them unfit for marketing but it also spreads the spinach blight from one plant to another. The seed-corn maggot feeds upon the main root and also upon the part of the plant above ground. Information on the control of spinach insects can be obtained from your State agricultural experiment station or from the United States Department of Agriculture, Washington, D. C. Farmers' Bulletin No. 1371, issued by the United States Department of Agriculture, contains information on the diseases and insects of garden vegetables.

Harvesting, Handling, and Yields

The entire plant is harvested at a time when it will give a maximum yield of tender succulent greens. If the plants are allowed to become old before being harvested, the quality of the product, whether fresh or canned, will be poor. On the other hand, if the plants are harvested too soon the yield will be low. In some cases the entire crop is harvested at once, but occasionally the beds are gone over and the larger plants removed and the remainder allowed a longer period to develop. Where this is done a broad-bladed knife similar to a putty knife is used in harvesting. Where the spinach is grown in rows it is frequently loosened by running a cutter along the rows, cutting off the plants at the surface of the ground (fig. 2).

Methods of packing the product for market vary, but the round, stave, bushel basket is most commonly used (fig. 3), while in some sections the bushel hamper is employed. Formerly large quantities of spinach were shipped in barrels, but the bushel basket or hamper is a better type of package for handling on the market. The common practice is to trim and pack the spinach in the baskets as it is cut. In a few cases the spinach is packed loosely in baskets or crates and hauled to a central packing shed, where it is washed before being packed in the baskets in which it is marketed. Where spinach is being packed for long-distance shipment a quantity of finely crushed ice is placed in each basket with the spinach. The canning crop is taken to the factory in baskets or other containers or in bulk on wagons or trucks fitted with suitable racks.

United States standards for spinach have been prepared and copies may be obtained by addressing the Bureau of Agricultural Economics, United States Department of Agriculture, Washington, D. C.

FIGURE 3.—Spinach packed in bushel baskets in the field.

Yields of from 600 to 700 bushels to the acre are not uncommon. Canning-crop growers often obtain yields of from 5 to 7 tons per acre, and higher yields are sometimes reported.

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